Chemistry Quiz
Nuclear and Organic Chemistry
Instructor's Version B

Answer Sheet

1.	C
2.	D
3.	D
4.	A
5.	A
6.	E
7.	D
8.	A
9.	B
10.	C

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Chemistry Quiz
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Free-Response Questions

Time Limit: You have 30 minutes to complete this section.
Scoring: 60 points total; Question 1 is worth 30 points, Question 2 is worth 25 points, and Question 3 is worth 5 points ; points for each section are indicated within the questions.
Calculator Use: You may use a calculator on both questions.

1. **Complete and balance the following nuclear equations** (5 points each)

A. $^{18}_{8}O \rightarrow {}^{4}_{2}He +$ _____ $^{14}_{6}C$ ___?

B. $^{223}_{87}Fr + {}^{0}_{1}e \rightarrow$ _____ $^{223}_{88}Ra$ _____?

C. _____ $^{90}_{39}Y$ _____? $\rightarrow {}^{90}_{40}Zr + {}^{0}_{-1}\beta$

D. _____ $^{26}_{12}Mg$ _____? $+ {}^{1}_{1}p \rightarrow {}^{4}_{2}He + {}^{23}_{11}Na$

E. $^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{94}_{36}Kr + {}^{139}_{56}Ba + 3$ _____ $^{0}_{1}n$ _____?

F. $^{40}_{19}K \rightarrow {}^{0}_{-1}\beta +$ _____ $^{40}_{20}Ca$ _____?

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2. Polonium-214 has a half life = 1.6 x 10^{-4} seconds. A 1.0 mole sample is monitored.

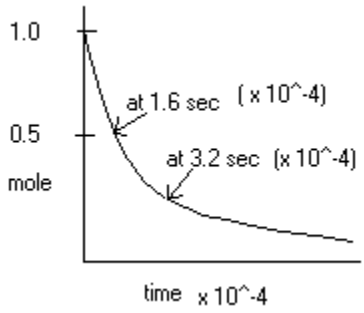
A. What is the rate constant for this decay? (5 points)

k = 0.693/ $t_{1/2}$ = 0.693/1.6 x 10^{-4} = 4300 (2 sig figs)

B. How much time has past when only 0.10 mol of the sample remains? (10 points)

ln N_o/N_t = kt
t = ln(1.0/0.10) / 4300 = 5.4 x 10^{-4} seconds

C. Draw a graph showing this decay process, with the amount of Po on the y axis, and time on the x axis. (5 points)



D. What data would need to be plotted against time on the x axis in order to obtain a straight line with a negative slope? (5 points)

A graph of ln [Po] vs. time or amount of Po vs. time

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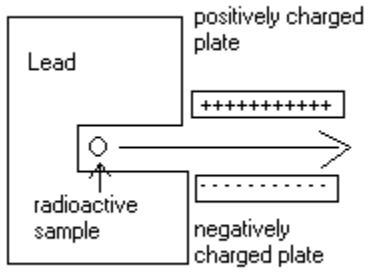
3. **A radioactive sample is placed in the chamber shown below. The radioactivity it emits follows the path shown. Is the decay alpha, beta, or gamma? Explain.** (5 points)



Cross section of a lead chamber

Must be gamma; it has no charge, and this decay is not deflected by the electric field.

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